National Institute of Environmental Health Sciences

Climate change air toxic co-reduction in the context of macroeconomic modelling

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Abstract:

This paper examines the health implications of global PM reduction accompanying greenhouse gas emissions reductions in the 180 national economies of the global macroeconomy. A human health effects module based on empirical data on GHG emissions, PM emissions, background PM concentrations, source apportionment and human health risk coefficients is used to estimate reductions in morbidity and mortality from PM exposures globally as co-reduction of GHG reductions. These results are compared against the "fuzzy bright line" that often underlies regulatory decisions for environmental toxics, and demonstrate that the risk reduction through PM reduction would usually be considered justified in traditional risk-based decisions for environmental toxics. It is shown that this risk reduction can be on the order of more than 4×10-3 excess lifetime mortality risk, with global annual cost savings of slightly more than $10B, when uniform GHG reduction measures across all sectors of the economy form the basis for climate policy ($2.2B if only Annex I nations reduce). Consideration of co-reduction of PM-10 within a climate policy framework harmonized with other environmental policies can therefore be an effective driver of climate policy. An error analysis comparing results of the current model against those of significantly more spatially resolved models at city and national scales indicates errors caused by the low spatial resolution of the global model used here may be on the order of a factor of 2.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution

Air Pollution: Particulate Matter

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Co-Benefit/Co–Harm (Adaption/Mitigation):

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact:

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Cost/Economic, Methodology

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified